



Section IV

Corporate Role in Food and Agriculture

*Special Issue: Mapping the Global Food Landscape***The changing agribusiness climate: Corporate concentration, agricultural inputs, innovation and climate change**Pat Mooney and ETC Group¹

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For the world's leading agribusinesses, climate change represents both a threat and an opportunity. The threat, of course, is the uncertainty of crop growing conditions and that supply chains won't be able to adjust and deliver inputs of seeds, pesticides, and fertilizers where and when they can be sold. There are two theoretical solutions. The traditional genetics response is to enlarge research to diversify crop and livestock species and to adapt other inputs as/if needed. Alternatively, agribusiness can opt for a different kind of diversification, expanding the limited—but tried and true—repertoire of crops and livestock to more markets on the assumption that they will have sufficient varietal/breed diversity “through time and space” to grow something without upsetting the food/feed processors and retailers.

The opportunity side also means expanding agribusiness services into Big Data software (including weather forecasting and crop insurance—see Isakson, this issue) and metre-by-metre management. Such management is handled through Climate-Smart input machinery that can deliver precise fertilizers and pesticides for specific varieties and growing conditions with, theoretically, reduced greenhouse gas (GHG) emissions. The pressure to reduce the misuse of pesticides and fertilizers could lead to a new set of agribusiness mergers, bringing the already-merged seed and pesticide markets together with fertilizers and farm machinery.

¹ ETC Group's preference is not to attribute research papers to specific staff members or consultants since all of our publications involve contributions from virtually every staff member.

Will agribusiness turn climate into a new market and merger opportunity? Or, will governments finally disband the agribusiness oligopoly and embrace the options already available through peasant-led breeding and agroecology? Will we have a chance to choose?

Innovation and the industrial food chain

Agricultural input companies are the stout first links in the Industrial Food Chain. Although ministers of agriculture talk up “field-to-fork” policies, industry knows the reverse is more accurate: the retail and processor demands drive agricultural inputs—from “fork to field.”² While accepting that the driver in the industrial system has been the “fork”, climate negotiators realize that the chain needs lengthening, from the crop and livestock genomics at the front end to the GHG emissions caused by fossil fuels, fertilizers, and methane at both ends—or as it was recently described to me, from “fuck to fart.”³ Innovation, for the Industrial Food Chain, begins at the wrong point. The bottom line is that the innovative capacity of the agricultural input companies is limited by their own oligopolistic market and by the unwillingness of the other end of the chain to tolerate change.

Historically, the Industrial Food Chain has served society badly in at least three respects:

- Since the Industrial Food Chain took hold after World War II, Western science has lost access to 75 percent of the genetic diversity of our major food crops. This diversity has been replaced by a handful of so-called “distinct, uniform and stable” varieties that meet the seed companies’ requirements for intellectual property protection, the farm machinery industry’s need for uniform planting and harvesting qualities, and the processors’ and retailers’ requirements for consistency and cosmetic traits.⁴
- In the half-century between the establishment of the 1961 UPOV treaty (the Union for the Protection of New Plant Varieties) and 2009, the crops that comprise most of a country’s calories have “imploded” (grown more homogenous) by 36 percent, with major consequences for nutrition and food security. While the number of crops available to most

² Personal communication with former food retail executive, Toronto, November 21, 2014.

³ *Ibid.* Also reiterated at FAO meetings in 2013.

⁴ Based on a review of FAO’s quinquennial Seed Reviews during the 1960s – 80s, ETC Group proposed the 75 percent estimate for major crops in the late 1980s. Canada’s International Development Research Center (IDRC) adopted this estimate in its own reports and FAO has since cited IDRC. In 2013, *The Economist* magazine used the same figure citing FAO. ETC Group argues that while 75 percent of the Centers of Diversity of major food crops has been “wiped out” with the planting of Green Revolution and/or commercial plant varieties, that most of this diversity still remains – out of sight to Western science – in the hands of peasant farmers growing under marginal conditions. Interestingly, the 75 percent estimate has never been challenged by crop geneticists or gene bank directors.

consumers has increased, those important to caloric intake and nutrition have declined. The most climate resilient crops show the greatest losses (Khoury et al., 2014).⁵

- Also, since World War II, the nutritional value—including micronutrients—of most cereals, fruits, and vegetables has fallen anywhere from 5 to 40 percent. While there are a few exceptions—like carrots where the cosmetic interest in orange colouring coincides with nutritional value—quality has been sacrificed for quantity. In a world threatened with the issues of overweight and obesity, we have to eat more to get the same nutrition (Davis, 2009). It may now take “two apples a day to keep the doctor away”.

In short, agricultural input companies in the Industrial Food Chain have lost us a third of our crops, three quarters of their genetic diversity, and much of the remainders’ nutritional value. This is the chain that proposes to lead us to food safety and security through Climate-Smart Agriculture.

A tale of two innovation systems

The resiliency of the Peasant Food Web is based on diversity: ready access to diverse crop and livestock species, diverse varieties and breeds, and cooperative research systems. That diversity should be available within the trading area of the farming community, and not necessarily on every farm. The expertise of neighbours—vertically, up and down hillsides and horizontally, along roadways—is essential.

Conversely, agricultural input companies maintain that they practice “diversity through time”. That is, while they may offer a limited number of genetically uniform varieties in a single growing season, they have an assembly line of innovative plant varieties ready to move into production, as needed, in subsequent plantings. While they concede that peasants may have much greater genetic diversity in the field in a single season—and these varieties change and adapt every growing season—they are not as diverse as those of the companies “over time”. With Climate-Smart Agriculture, companies now claim “Diversity through time and space”: not only can they change varieties every growing season, but they can also offer varieties of the same crop for almost any climatic condition. In other words, the maize variety they sold last year in Mexico might work this year in Iowa, while last year’s Iowa variety might make do in Saskatchewan this year.

Let’s compare the known, practical innovative capacity of the Industrial Food Chain with the Peasant Food Web. In the half-century since the adoption of intellectual property over plant varieties, seed companies have focused down from 7000 domesticated species to 150, and almost

⁵ Between 1961 and 2009, homogeneity increased by 16.7 percent, as measured by the mean change in similarity between each country and the global standard composition, with a maximum (single-country) change of 59.7 percent. Likewise, mean among-country similarity increased by 35.7 percent.

all investment is on no more than a dozen crops. During that same time period, more than 80,000 plant varieties have won intellectual property protection but 59 percent of these varieties have been ornamentals such as roses and chrysanthemums.⁶ Indeed, the world’s largest seed companies often describe themselves as “corn companies”, conceding that 45 percent of global private sector investment is on one crop—maize.

In the same timeframe, peasants around the world have donated approximately 2.1 million unique plant varieties to national and international gene banks. These peasant-bred varieties cover all 7000 domesticated species. Most, but not all, of these peasant-bred varieties are still adapting and changing in the field and are used by farming communities for plant breeding (ETC Group, 2013b). In the livestock sector, the industry has narrowed its innovations to five species—poultry, pigs, bovines, sheep and goats—and roughly 100 breeds (ETC Group, 2013b). Comparatively, peasants breed and nurture at least 40 livestock species and more than 7000 breeds that are hugely more genetically diverse and robust than their industrial cousins (ETC Group, 2013b).

As significantly, peasants not only conserve but also have immediate access to the most commercially important agricultural biodiversity for crops, livestock and much more. So-called “crop wild relatives” are recognized to be at the cutting edge of Climate-Smart Agriculture. Public and private breeders are working with 700 crop wild relatives. Peasants conserve and/or use between 50,000 and 60,000 crop wild relatives that often grow adjacent to their fields (ETC Group, 2013b). Indigenous and peasant communities are also much more successful at safeguarding “protected areas”. In Brazil, for example, the biodiversity lost in peasant-protected areas was 0.6 percent while the losses in government-protected areas was 7 percent. In Mexico, indigenous protected areas were four times more effective and, in Guatemala, 20 times more. At least 1 billion people depend on these areas for food and livelihoods (Pearce, 2014).

If there is a choice to be made between the Peasant Food Web’s “diversity now” and the Industrial Food Chain’s “diversity through time and space”, history shows that the peasants keep it and the corporations lose it. Talk of “time and space” is for Space Cadets.

Concentration versus innovation

As a rough benchmark, economists say that when four firms control 40 percent of a market, it is no longer competitive. Beyond the point where 4 firms control about 50 percent of a market, the

⁶ This is not a contradiction. Ornamentals are vastly less expensive to breed and require almost no regulation meaning that many individuals as well as companies develop new varieties every year. Conversely, the average genetically modified plant variety costs US\$136 million.

concern is a greater likelihood of anti-competitive conduct, and that concentration has a depressing effect on innovation (Bryce 1978).⁷

The logic of increased concentration in corporate control is that PR (Public Relations) beats PR (Private Research). Profits are higher when companies compete in advertising and market management rather than high-risk research. The intellectual property protection that seed and pesticide companies demanded in the 1960s and 70s is now clearly a deterrent to innovation. Large patent portfolios are not a sign of innovation but a barrier to entry to new companies, especially when the members of an oligopolistic market cross-license one another on the pretext of retiring patent disputes and reducing litigation costs.

How concentrated are agricultural inputs? The top 10 global seed companies control 75.3 percent of commercial seed sales. The world's 10 leading pesticide companies control 94.5 percent of sales. But, six of the biggest pesticide manufacturers are also six of the biggest seed companies and together, these six control 75 percent of all private sector crop research (ETC Group, 2013a). Back in the 1970s, chemical companies realized, largely for regulatory reasons, that it was cheaper and faster to adapt plants to pesticides than the other way around. Genetic engineering became the logical tool to realize their Holy Grail: herbicide-tolerant plant varieties—proprietary plants that need their proprietary chemicals—through GM crop technologies.

Until now, livestock genetics have been less high-tech, but have still led to corporate concentration. Seven corporations overwhelmingly dominate breeding for the five commercially important species. Ten companies account for 81 percent of the global “Animal Pharma” market in veterinary medicines (ETC Group, 2013a). Because of the bulk, generic, nature of the fertilizer industry, the top 10 global companies only account for 41 percent of the market. Nevertheless, lead corporations in the industry have a classic and unparalleled century long record of cartels and price fixing (ETC Group, 2013a). That leaves the US\$65 billion a year farm machinery business, where just three companies account for around 77 percent of worldwide sales (Munshi, 2014).

Not only does the oligopolistic nature of the agricultural input industry mitigate against innovation, Climate-Smart Agriculture uses Naomi Klein's “Shock Doctrine” to argue for greater concentration not only to achieve efficiencies of scale but to allow for cross-cutting innovations among different inputs. Concentration across input sectors could encourage real innovation. Herbicide-tolerant plant varieties are an obvious case in point. Whether this innovation is beneficial to food or farming—or only profitable to the companies—is another issue. Sadly, there is no serious review process or quality control in private sector agricultural research.

⁷ Bryce (1978) is the *Report of the Royal Commission on Corporate Concentration*. The Report explains: “There is a general consensus among other studies that concentration aids innovation within the firm up to a threshold level, after which there is no further positive relationship. Scherer, for example, concluded that ‘technological vigor’ increased to the point at which the four-firm concentration ratio reached 50-55 percent, after which increasing concentration had a depressing effect on innovation.” The Report also refers to a “market concentration doctrine,” which holds, in particular, “that the greater the concentration of economic activity in a few firms, the greater will be the likelihood of anticompetitive conduct among these firms.”

Almost all research is considered “proprietary business information” and not accessible to others. We have no way of knowing what companies have tried or what has failed. Input companies can safely claim to be highly innovative without fear of challenge.

Well, perhaps not entirely. According to the USDA, the average genetically modified crop variety developed in the United States comes at a cost of US\$136 million (ETC Group, 2013b). Back in the 1970s, plant breeders were content with the rough estimate that the development of a new commercial variety was well under US\$1 million. Even accounting for inflation, the research and development (R&D) cost is breathtaking. The R&D product is not breathtaking.

If we compare R&D in the pharmaceutical industry, there are serious reasons to be concerned. Arguably, the development of new drugs is the most publicly monitored and tightly regulated research activity in the world. Despite this, two major drug companies—BASF and Amgen—have recently insisted that about two thirds of the peer-reviewed research experiments published in major journals can’t be replicated (“Combatting bad science,” 2014). In a series of articles, *The Lancet* (the Journal of the British Medical Association) argued that fully 85 percent (US\$200 billion per year) of all medical research is either wasted or at least poorly executed (“Combatting bad science,” 2014). If this is the experience of the most regulated industry, what should we expect from agricultural input companies that fly so comfortably below our social and regulatory radar?

From seeds to software

The input end of the food chain is expanding. In the last year, Monsanto has spent US\$1 billion buying two high-tech weather surveillance companies and has also invested heavily in Big Data. The company claims to have detailed historical information on 30 million US farm fields with the precision focused down to 10 x 10 metre units. In the year since it bought Climate Corp.—which uses satellites and aircraft to survey fields and sells crop insurance—Monsanto has increased the customer base for its Climate Basic app to cover more than one third of all US farm land. The company intends to extend its Big Data surveillance around the world (McDonald, 2014). Where Monsanto goes, DuPont and Syngenta are sure to follow. The agricultural inputs industry is positioning itself to be able to advise (i.e. “command”) farmers on what seeds of what crops they should grow on what plots and with which pesticides and fertilizers – metre by metre. Failure to do what the input company recommends could nullify the crop insurance. The only remaining question: Will the big three farm machinery companies buy out the big three seed/pesticide companies, or vice versa?

Do we have choices?

Global agriculture is already heavily impacted by climate change. Can we really do anything more than rap the knuckles of the input companies and hope they do better? If we dismantle the first links in the Industrial Food Chain, do we risk unraveling the entire chain? What could we put in its place?

We do have another choice. 70 percent of the world's food, the food both needed and eaten,⁸ is provided by peasants, from small farms, urban gardens, forests, roadsides, rivers and seacoasts. Taking all of these sources into account, probably far less than 10 percent of the food that is produced worldwide trades across international boundaries, and the vast majority is consumed within the watershed or ecosystem where it is produced. If we want food on the table in a world of changing climates, the focus must be on peasant-led research.

This can sound like Pollyanna politics. The transaction costs and time involved in working with half a billion farmers and even more gardeners across several thousand languages, cultures, and ecosystems, seems overwhelming. Agriculture has to change profoundly in the next few decades.

Peasants have made huge, fast changes before. Without roads or railways or Mendel or Monsanto, peasants spread maize and a half dozen other South American crops throughout Africa, adapting to widely different ecosystems, in less than a century (Brockway, 1970, p. 42). Likewise, other South American crops including sweet potatoes spread across Southeast Asia and China, adapting from mangrove swamps to mountaintops also in less than a century.⁹ Between the 1850s and the 1920s, the US Patent Office—of all places—distributed a cornucopia of free seeds collected around the world to settlers crossing the Mississippi to California. The farmers quickly identified the seeds and crops that worked, and created one of the world's biggest breadbaskets over a couple of generations (Fowler, 1994). What peasants accomplished without Mendelian Plant Breeding or modern communications is still easier today where many peasants – and every peasant organization – have access to a cell phone and camera. La Via Campesina—with hundreds of national peasant organizations and hundreds of millions of peasant supporters—places a strong emphasis on seeds and agricultural biodiversity. Members routinely exchange seeds when they meet and send one another photos of their seeds, fields, and diseases, instantly sharing advice and experience.

Peasant-led agricultural research is not a backward or defensive strategy. As much as peasants can use smart phones, they can also take advantage of what remains of public sector science. Western science favours “high-tech” research that usually advances micro-changes in chemistry or biology that might have macro-applications; that is, they can be applicable for

⁸ ...and not either wasted or “waisted”—overconsumption is not only a health but also an economic and environmental cost.

⁹ The scientific literature has occasionally suggested that the sweet potato had an earlier “accidental” transfer from the Americas across the Pacific Islands to Asia including China but, if it did, it doesn't seem that the transfer had a significant impact.

several species or ecosystems. On the other hand, peasants specialize in broader, farm-system innovations or macro-advances for their microenvironment—“Wide Tech”. Farmers’ organizations and scientific institutes can collaborate as long as the peasants are the leaders. If needed, peasants can also get seeds and advice from the world’s 50 global and regional gene banks. Virtually every country also has a gene bank that can be accessed.

Such a reoriented research strategy could mean that the world would not only withstand climate change, it could possibly substantially increase not only our food choices but also our food quality and quantity. Instead of depending on a handful of energy-dense carbohydrate crops and resource damaging livestock, our larders could be overflowing with diversity.

So, what’s stopping peasants from scaling up? Agricultural input companies backed by the rest of the Industrial Food Chain. National regulatory systems – heavily influenced by international trade regimes even when the food doesn’t cross borders – are skewed so that both health/phytosanitary regulations and markets block diversity, supporting standardized large-scale production systems. The world can meet the challenges of a changing climate but only if we change the chain.

Every time we support local farmers markets, community shared agriculture, agroecology and organic farms, and press for municipal regulations friendly to urban and periurban gardening and livestock keeping, we are challenging and changing the system.

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